RESEARCH PAPER

Comparative Evaluation Of The Effect Of Autologous Fibrin Glue And Cyanoacrylate Adhesive On Tissue Healing After Periodontal Surgery -A Randomized Clinical Study

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ABSTRACT

OBJECTIVE: In the evolving domain of surgery, novel approaches have overcome the drawbacks associated with conventional suturing techniques, allowing clinicians to better fulfill the increasing expectations of patients. Fibrin-sealing systems offer an effective alternative for post-surgical tissue stabilization, as they are simple and quick to apply, thereby promoting enhanced wound healing. Autologous preparations, in particular, reduce the chances of contamination and immunological reactions when compared with commercially available fibrin adhesives. Likewise, cyanoacrylate adhesives (CAA) have shown encouraging results, as they undergo rapid polymerization in the presence of catalysts and hydroxyl groups, forming a durable adhesive layer that ensures efficient tissue approximation. The present investigation is designed to comparatively assess the effectiveness of CAA and autologous fibrin glue (AFG) on tissue healing following periodontal surgery.

STUDY DESIGN: In a Split-mouth randomized clinical study in which 20 sites requiring conventional flap surgery were selected, flap closure was done in group A (10 sites) using CAA and in group B (10 sites) using AFG. The healing index, roll Test, visual analog scale, and probing depth were measured at baseline, 7 days, and 1 month after surgery.

RESULT: The AFG group (Group B) exhibited superior healing outcomes, characterized by reduced pain and lower roll test scores compared with the CAA group (Group A). Hence, Group B achieved more favorable results than Group A.

CONCLUSION: Based on the results, it was interpreted that the healing process is notably superior in the AFG group, reflecting improved tissue adaptation and stability compared to the CAA group.

Keywords: autologous fibrin glue (AFG), cyanoacrylate adhesive (CAA), tissue adhesion, tension-free wound closure, tissue repair, alternative to traditional Sutures.

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INTRODUCTION

Suturing has long been regarded as a fundamental technique in surgical practice, serving as the primary method for wound closure across various medical disciplines. It provides mechanical stability, ensures precise tissue approximation, and facilitates hemostasis, thereby creating favorable conditions for wound healing. Over time, advancements in suture materials and techniques have significantly enhanced surgical outcomes. Alongside these developments, tissue adhesives have emerged as an alternative approach to wound closure, offering advantages such as ease of application, reduced operative time, and elimination of the need for suture removal.[1]

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Sutures may also serve as plaque-retentive or debris-retentive factors, increasing the risk of microbial colonization and secondary infection. In addition, patients often experience postoperative discomfort and pain related to suture placement and removal. These limitations have prompted the exploration of alternative wound closure methods, particularly sutureless techniques such as tissue adhesives.[2, 3]

In dentistry, and more specifically in periodontology, effective wound closure is a critical determinant of surgical success. Periodontitis is a chronic, multifactorial inflammatory disease associated with the accumulation of dental plaque (dental biofilm) and is characterized by the progressive destruction of the tooth-supporting apparatus, including the periodontal ligament and alveolar bone.[4] Periodontal flap surgery remains a commonly performed procedure for managing such conditions, where the outcome depends on precise incision design, atraumatic flap reflection, and thorough debridement of soft and hard tissues, `followed by proper stabilization of the flap. Suturing plays a pivotal role in maintaining flap position and ensuring optimal healing, with the ultimate goal of periodontal therapy being the arrest of disease progression and promotion of tissue repair.[5]

However, similar to other surgical fields, sutures in periodontal therapy are associated with certain limitations, including plaque accumulation, increased postoperative discomfort, and potential tissue reactivity, which may adversely influence healing.[6,7] These concerns have led to growing interest in the use of tissue adhesives as substitutes for conventional sutures in periodontal procedures. Among these, cyanoacrylate adhesive (CAA) and autologous fibrin glue (AFG) have shown promising results. CAA, first synthesized in 1959 by Coover et al., are fast-acting monomeric adhesives that rapidly polymerize in the presence of moisture to form strong and durable bonds, exhibiting properties such as biocompatibility, bacteriostatic action, hemostasis, and anti-inflammatory effects.[8] AFG is a biologically derived adhesive prepared from the patient's own blood, composed mainly of fibrinogen and thrombin, which interact to form a fibrin matrix that promotes tissue adhesion and healing, while minimizing the risk of immunological reactions and infection.[7,9] Therefore, the present study aims to comparatively evaluate soft tissue healing following periodontal flap surgery using two different fibrin-sealing systems.

MATERIALS AND METHODS

For split – mouth randomized clinical study, a total of 15 patients were selected from the Outpatient Department of Periodontology. Ethical clearance was obtained from the institutional ethics committee (project code: MDC.P.98, Ref. No./MDC/2025/437A). The study was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from each participant. The study included patients of both genders, aged 20 to 50 years, who presented with moderate to severe periodontitis, a probing depth of ≥5 mm, attachment loss of ≥5 mm, and maintained satisfactory oral hygiene. Pregnant or lactating women, individuals with systemic diseases, smokers, tobacco chewers, and those with habits or medications that could interfere with the healing process were excluded from the study. Clinical parameters were evaluated as follows: the healing index at 7 days and 1 month, the roll Test at baseline, 7 days, and 1 month, the Visual Analogue Scale (VAS) at 7 days and probing depth (PD) at baseline and 1 month.

For Autologous fibrin glue (AFG) preparation,10 ml of blood was withdrawn by venipuncture from the antecubital fossa using a 23-G disposable syringe. The collected blood was transferred into 0.9% sodium citrate-containing vacutainers (light blue cap) and centrifuged at 3000 rpm for 10 minutes, resulting in the separation of three layers: platelet-poor plasma at the top, platelet-rich plasma in the middle, and red blood cells at the bottom. After the first centrifugation, the red blood cell (RBC) fraction was discarded, and the platelet-poor and platelet-rich plasma were carefully aspirated and transferred into a red-top vacutainer. One part of protamine sulfate (10 mg/ml) was added to the red Vacutainer to precipitate fibrinogen from the plasma, followed by centrifugation at 1000 rpm for 5 minutes to separate thrombin (autologous serum) and fibrinogen. Fibrinogen was separated in the bottom layer, and autologous thrombin in the top layer. 0.5 mL of autologous thrombin was used to activate the fibrinogen and was drawn in a separate syringe. Calcium chloride, in equal proportion to autologous thrombin and fibrinogen, was loaded into a separate syringe. Equal volumes from both syringes were simultaneously applied to the surgical site.[10] [**Figure 1a-h**].

Figure 1:

Figure 1: (a)10 ml of blood was withdrawn; (b) centrifuged at 3000 rpm for 10 minutes; c) resulting in the separation of layers:plasma(at the top), RBCs(at the bottom) (d) After 1st centrifugation, the RBC-containing section is discarded; (e) protamine sulfate; (f) protamine sulfate was added and centrifugation at 1000 rpm for 5 minutes; (g) Calcium chloride; (h) Calcium chloride with autologous thrombin and fibrinogen was taken in equal parts in a separate syringe.

Phase I therapy was performed for all patients at baseline, and oral hygiene instructions were reinforced at periodic recall visits. Two sites per patient were selected and randomly assigned as Site A and Site B. The operational site was anesthetized with 2% lignocaine with adrenaline at a 1:80,000 concentration, and incisions were made on the facial and lingual/palatal surfaces. A mucoperiosteal flap was elevated, exposing 1–2 mm of alveolar bone, followed by thorough debridement of the root surfaces using Gracey curettes to remove granulation tissue and condition the cementum. At site A, CAA [**Figure 2a-e]** and in site B, AFG [**Figure 3a-e**] were used, respectively, to achieve maximum adaptation and closure of the wound. Under digital pressure, the flap was held in position for 2-3 minutes for better adaptation.[11] The Patient was prescribed systemic antibiotics and anti-inflammatory drugs for 3 days to reduce postoperative pain and edema.

Figure 2:

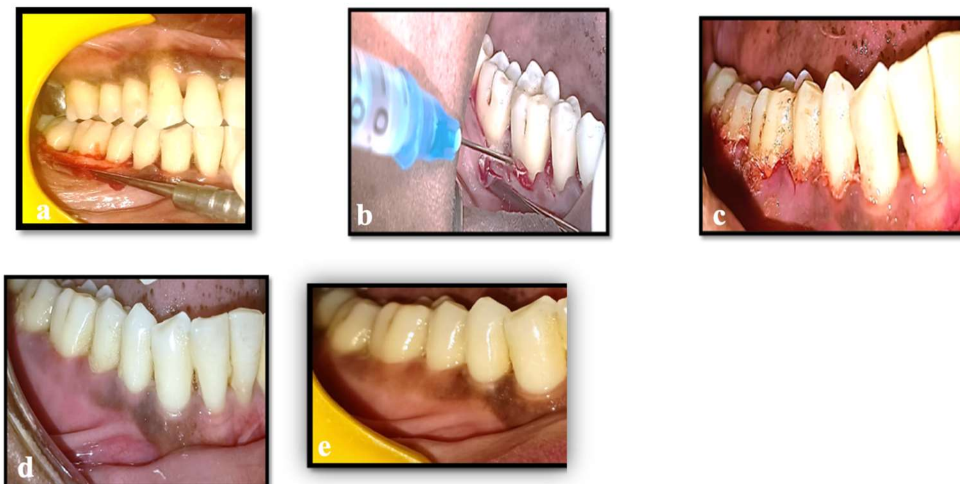

Figure 2: (a) Flap was raised, through debribement was done; (b) application of CAA in site A; (c)after applying digital pressure for 2-3 min, the flap was adapted; (d)After 7 days; (e) After 1 Month.

Figure 3:

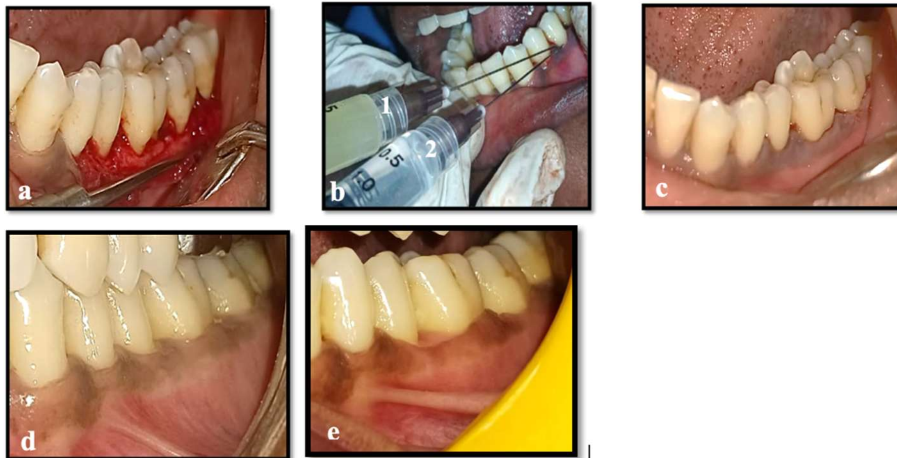

Figure 3: (a) Flap was raised, through debribement was done ;(b) application of AFG in site B:1-thrombin and fibrinogen,2- Calcium chloride;(c) after applying digital pressure for 2-3 min, the flap was adapted; (d)After 7 days; (e)After 1 Month

Parameters Assessed & Tests Performed:

1. Roll test:[10] A Clinical method used to check the stability and adhesion of a flap after surgical procedures. It is performed by placing the side of the periodontal probe at the base of the papilla, gently rolling the probe in an apical direction, and observing weather the papilla or flap shows any movement. Criteria for evaluation are given in Table 1.

Table 1: Roll Test

Score	Criteria
Score 1	Barely visible movement of the papilla
Score 2	Clearly visible movement but no retraction of the papilla
Score 3	Clearly visible movement with retraction of the papilla.

2. Simplified healing index (Landry et al) [12] clinical index used to evaluate the healing of soft tissue after surgery. Criteria for evaluation are given in Table 2.

Table 2: Simplified healing index

Score	Criteria
Very poor	Tissue color: ≥50% of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with loss of epithelium beyond incision margin Suppuration: Present
Poor	Tissue color: ≥50% of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with connective tissue exposed.

Good	Tissue color: ≥25% and <50% of gingiva red. Response to palpation: No bleeding Granulation tissue: None. Incision margin: No connective tissue exposed.
Very good	Tissue color: <25% of gingiva red Response to palpation: No bleeding Granulation tissue: None. Incision margin: No connective tissue exposed
Excellent	Tissue color: All tissues are pink. Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed

3. The level of pain was measured by the visual analog scale (VAS) [13]. This scale is a ruler that is divided into 10 parts, with the beginning of the ruler (zero) indicating painlessness, and the end of the ruler indicating the maximum pain that a person can imagine. The patient marked the level of pain every day for the first week in the questionnaire according to the VAS ruler (Figure 4). Criteria for evaluation are given in Table 3.

Table 3: Visual analog scale (VAS)

Score	Criteria
0-1	Absent of pain
2-4	Mild pain
5-7	Moderate pain
8-9	Severe pain
10	Extremely severe pain

STATISTICAL ANALYSIS

All recorded data were entered into Microsoft Excel and subsequently analyzed using SPSS software version 26.0 (IBM, Chicago, USA). Both paired and unpaired Student's *t*-tests were applied to assess associations between variables. A p-value of <0.05 was considered statistically significant, with the actual power of the study calculated at 0.96.

RESULT

The mean roll test scores and mean pocket probing depths before surgery showed no significant difference between the Cyanoacrylate Adhesive (CAA) group (Group A) and the Autologous fibrin glue (AFG) (Group B), with t-values of 0.19 and 0.23 and identical p-values of 0.89 **(Table 4)** for both comparisons.

Table 4: Comparison of index values at baseline

Index	Cyanoacrylate	Fibrin Glue	T value	P value
Roll test	2.30±0.85	2.20±0.74	0.19	0.89
PPD	5.80±0.85	5.60±0.74	0.23	0.86
PPD - pocket probing depth, T value - student t test, P value - probability value				

The mean pain score at 7 days post-surgery was significantly higher in Group A compared to Group B, with a t-value of 7.25 and a p-value of 0.001. Similarly, the mean healing index in Group A was significantly lower than in Group B, with a t-value of 2.18 and a p-value of 0.033. Additionally, the mean roll test score was significantly lower in Group A compared to Group B, with a t-value of 3.90 and a p-value of 0.001**(Table 5).** These findings suggest that Group B experienced better healing outcomes, characterized by reduced pain and improved roll test scores after 7 days of surgery.

Table 5: Comparison of index values after 7 days of surgery

Index	CAA	AFG	T value	P value
Pain	4.20±0.20	2.80±0.15	7.25	0.001*
HI	2.70±0.30	3.20±0.43	2.18	0.033*
Roll test	1.80±0.23	1.30±0.17	3.90	0.001*
HI – healing index, T value - student t test, P value - probability value				

At one month post-surgery, the pocket probing depth in Group A was significantly greater than in Group B, with a t-value of 2.27 and a p-value of 0.022. The healing index was also significantly lower in Group A compared to Group B, with t-values of 2.27 and 2.09 and p-values of 0.022 and 0.041, respectively. Additionally, the mean roll test score in Group A was significantly lower than that of Group B, with a t-value of 3.15 and a p-value of 0.008 **(Table 6)**. These results indicate that Group B demonstrated superior healing outcomes, with reduced pocket probing depth and improved roll test scores one month after surgery.

Table 6: Comparison of index values after 4 weeks of surgery

Index	CAA	AFG	T value	P value
PPD	3.30±0.20	2.80±0.27	2.37	0.022*
HI	4.10±0.35	4.50±0.28	2.09	0.041*
Roll test	1.40±0.23	1.10±0.17	3.15	0.008*
PPD - pocket probing depth, HI – healing index, T value - student t test, P value - probability value				

In the intra-group comparison for CAA, the mean roll test score showed a significant decrease one week after surgery compared to baseline, with a t-value of 5.25 and a p-value of 0.001. Similarly, the mean pocket probing depth significantly decreased, with a t-value of 8.84 and a p-value of 0.001.

In the AFG group, the mean roll test score also significantly decreased one week post-surgery compared to baseline, with a t-value of 7.99 and a p-value of 0.001. The mean pocket probing depth showed a significant reduction, with a t-value of 12.37 and a p-value of 0.001.**(Table 7)**

These findings indicate a significant improvement in both roll test scores and pocket probing depths from baseline to one week post-surgery in both groups.

Table 7: Intra group comparison of Index value

Group	Index	Baseline	4 weeks	T value	P value
CAA	Roll test	2.30±0.85	1.40±0.23	5.25	0.001*
	PPD	5.80±0.85	3.30±0.20	8.84	0.001*
AFG	Roll test	2.20±0.74	1.10±0.17	7.99	0.001*
	PPD	5.60±0.74	2.80±0.27	12.37	0.001*
PPD - pocket probing depth, T value - student t test, P value - probability value					

DISCUSSION

Sutures have traditionally been the cornerstone of wound closure across surgical disciplines, including periodontology, owing to their ability to provide mechanical stability, precise tissue approximation, and hemostasis. Despite their widespread acceptance, sutures are associated with certain limitations.[3]

In response to these challenges, tissue adhesives have emerged as viable alternatives in surgical practice, offering the advantages of tension-free closure, reduced

operative time, and improved patient comfort. Among these, cyanoacrylate (CAA) and autologous fibrin glue (AFG) have gained attention for their applicability in periodontal flap closure.

The present study highlights the successful implementation of a simplified chairside preparation technique for autologous fibrin glue, as described by Bhumit and Sunil in 2016, utilizing minimal components.[10] The roll test employed in this study has previously been reported by Dave et al., demonstrating comparable findings, while the healing index outcomes observed in the present study were superior to those reported by Landery et al.[11] These findings suggest that adhesive-based approaches may offer favorable clinical performance in comparison to conventional suturing techniques.

Recent investigations exploring cyanoacrylate adhesives has shown a statistically significant reduction in plaque index was observed in the group compared to the suture group during the early postoperative period, although no significant differences were noted at later intervals such as six weeks and three months.[14] Similar observations have been reported by Parmar, Mayur, and Shah et al.[15] Furthermore, studies by Jannat Gautam (2024) demonstrated reduced postoperative pain and discomfort with the use of CAA,[16] while Andreas Pabst (2023) reported improved marginal flap stability with cyanoacrylate-based adhesives compared to conventional sutures.[17] However, despite these advantages, concerns regarding cytotoxicity, material rigidity, and limited clinician acceptance have restricted their widespread clinical application.

In contrast, autologous fibrin glue has shown considerable promise as a biologically derived alternative for flap closure. Being prepared from the patient's own blood, AFG minimizes the risk of immunological reactions and enhances biocompatibility.[10] Studies by Pradhan (2023) and Mittal (2024) have demonstrated improved tissue adaptation, effective hemostasis, and enhanced wound healing with the use of AFG.[18,19,20] Additionally, AFG functions as a fibrin scaffold enriched with growth factors, thereby promoting tissue regeneration and reducing the risk of contamination, which contributes to improved postoperative healing outcomes.[21]

Within the context of periodontal surgery, where optimal flap stability and uneventful healing are critical, these findings underscore the evolving shift from conventional suturing to adhesive-based techniques. While both CAA and AFG have demonstrated outcomes comparable to sutures, the biological advantages and regenerative potential associated with autologous fibrin glue suggest that it may offer a more favourable approach for periodontal flap closure.

CONCLUSION

Autologous fibrin glue (AFG) has proven to be an effective and reliable option for promoting healing in mucoperiosteal flap closure following open flap debridement procedures. Apart from being an efficient, economical, and patient-friendly method, AFG has also been shown to significantly improve post-surgical outcomes, including reduced pain and enhanced comfort during the recovery period.

This study has also shown that with reduced pocket probing depths and better roll test scores, reflecting improved tissue adaptation and stability compared to the cyanoacrylate adhesive group.

Limitations of the Study

The study had a small sample size and short follow-up period, limiting generalizability and long-term evaluation. Additionally, absence of microbiological and histological analysis restricts deeper understanding of the healing mechanisms involved

Abbreviations

AFG – utologous fibrin glue
CAA – Cyanoacrylate adhesive
PS – Periodontal surgery
TH – Tissue healing
RCT – Randomized clinical trial
PI – Plaque index
GI – Gingival index
HI – Healing index
PPD – Probing pocket depth
CAL – Clinical attachment level

REFERENCES

1. Spotnitz WD, Burks S. Hemostats, sealants, and adhesives: components of the surgical toolbox. *Transfusion*. 2008;48(7):1502–1516. **doi:** 10.1111/j.1537-2995.2008.01703.
2. Moy RL, Lee A, Zalka A. Commonly used suture materials in skin surgery. *Am Fam Physician*. 1991;44(6):2123–2128.
3. Hochberg J, Meyer KM, Marion MD. Suture choice and other methods of skin closure. *Surg Clin North Am*. 2009;89(3):627–641. **doi:** 10.1016/j.suc.2009.03.001
4. Papapanou PN, Sanz M, Buduneli N, et al. Periodontitis: consensus report of workgroup 2 of the 2017 World Workshop. *J Periodontol*. 2018;89(Suppl 1):S173–S182. **doi:** 10.1002/JPER.17-0721
5. Newman MG, Takei HH, Klokkevold PR, Carranza FA. *Carranza's Clinical Periodontology*. 13th ed. St. Louis: Elsevier; 2019.
6. Leknes KN, Selvig KA. Influence of suture materials on bacterial colonization and wound healing. *J Clin Periodontol*. 1999;26(12):845–853. **doi:** 10.1034/j.1600-051x.1999.261206

7. Döri F, Huszár T, Nikolidakis D, et al. Effect of platelet-rich fibrin on healing. *Clin Oral Investig*. 2013;17(3):769–779. **doi:** 10.1007/s00784-012-0721-9
8. Coover HW, Joyner FB, Shearer NH, Wicker TH. Chemistry and performance of cyanoacrylate adhesives. *J Soc Plast Eng*. 1959;15:413–417.
9. Spotnitz WD. Fibrin sealant: the only approved hemostat, sealant, and adhesive. *Transfusion*. 2004;44(12 Suppl):2S–4S. **doi:** 10.1111/j.1537-2995.2004.04073.
10. Dave BP, Sathyanarayana S. Periodontal flap closure using a simplified autologous fibrin glue preparation: A report of two successful cases. J Indian Soc Periodontol. 2020;24:579-582 **doi:** 10.4103/jisp.jisp_226_20
11. Romanos GE, Strub JR. Effect of Tissucol on connective tissue matrix during wound healing: an immunohistochemical study in rat skin. J Biomed Mater Res.1998;39:462-8. **doi:** 10.1002/(SICI)1097-4636(19980605)
12. Landry RG, Turnbull RS, Howley T. Effectiveness of benzydamine HCl in the treatment of periodontal post-surgical patients. Res Clin Forums 1988;10:105-18
13. Jung GH, Jung S, Park HJ, Oh HK, Kook MS. Factors Influencing Perception of Facial Attractiveness: Gender and Dental Education. J Craniofac Surg. 2018;2:170-175. **doi:** 10.1097/SCS.0000000000004065
14. Khurana JV, Mali AM, Mali RS, Chaudhari AU. Comparative evaluation of healing after periodontal flap surgery using isoamyl 2-cyanoacrylate (bioadhesive material) and silk sutures: A split-mouth clinical study. J Indian Soc Periodontol.2016;20:417-422. **doi:** 10.4103/0972-124X.186763
15. Parmar, Mayur & Shah, Chirag & Desai, Khushboo & Budhiraja, Shilpa & Kumar, Santosh. Evaluation and Comparison of Healing of Periodontal Flaps when Closed with Silk Sutures and N-Butyl Cyanoacrylate: A Clinico-Histological Study. 2013; 3:7-14. **doi:** 10.4103/2231-0754.119466
16. Gautam J, Sood A, Chaudhry S, Ghumman S, Chopra A. Beyond the Needle: A Comparative Evaluation of Silk Sutures and Cyanoacrylate for Periodontal Flap Closure. Cureus.2024;16:56604. **doi:** 10.7759/cureus.56604
17. Pabst A, Becker P, Kuchen R, Schumann S, Kasaj A. A comparative study of cyanoacrylate-based tissue adhesive and surgical sutures on marginal flap stability following coronally advanced flap. Clin Oral Investig. 2023;28:5. **doi:** 10.1007/s00784-022-04730-5
18. Mittal A, Srivastava N, Bhargava N, Kulshrestha R, Kaur A, Rafiq Z. Effect of autologous fibrin glue on soft tissue healing after periodontal flap surgery: a clinically designed study. Front Health Inform. 2024;13:3989-3997.
19. Pradhan N, Anup Belludi S, R S, Hr V, James R. Evaluation and comparison of the efficacy of autologous fibrin glue with 4-0 silk sutures in periodontal flap closure and wound healing - A split mouth randomized controlled trial. J Biomater Appl. 2023;38:412-423 **doi:** 10.1177/08853282231157306
20. Mounsif M, Smouni FE, Bouziane A. Fibrin sealant versus sutures in periodontal surgery: A systematic review. Ann Med Surg (Lond). 2022;76:103539. **doi:** 10.1016/j.amsu.2022.103539
21. Soundarajan, Subasree. (2021). Comparison Of Simplified Autologous Fibrin Glue Versus Suturing For Periodontal Flap Closure - A Randomised Controlled Trial. International Journal of Dentistry and Oral Science. 2021;8:3810-3815. **doi:** 10.19070/2377-8075-21000760